

IN THE CLAIMS

1. (Original) An on-channel repeating apparatus for an Advanced Television System Committee (ATSC) terrestrial digital TV broadcasting service, in which a terrestrial digital television broadcast signal is repeated over an on-channel, the on-channel repeater comprising:

- a receiving unit for receiving a Radio Frequency (RF) broadcast signal from a main transmitter;

- a frequency downlink converting unit for converting the received RF broadcast signal into an intermediate frequency (IF) signal based on a first reference frequency;

- a demodulating unit for converting the converted IF signal into a baseband signal;

- an equalizing unit for removing a predetermined signal generated between the main transmitter and the on-channel repeater from the converted baseband signal;

- a modulating unit for converting the baseband signal outputted from the equalizing unit, into an IF signal;

- a frequency uplink converting unit for converting the IF signal into a RF broadcast signal based on a second reference frequency;

- a high power amplifying unit for amplifying and repeating the converted RF broadcast signal;

- a transmitting unit for transmitting the RF broadcast signal outputted from the high power amplifying unit; and

- a signal synchronizing unit for generating the first reference frequency to provide the generated first reference frequency for the IF downlink converting unit to the demodulating unit which shifts the IF signal to the baseband signal, and generating the second reference frequency based on the first reference frequency to provide the generated second reference frequency for the RF uplink converting unit such that the transmission/reception signal are frequency-and-phase synchronized.

2. (Original) The on-channel repeater as recited in claim 1, wherein the receiving unit includes:

a reception antenna for receiving the RF broadcast signal from the main transmitter;
and
a RF receiving unit for receiving the RF broadcast signal from the reception antenna.

3. (Original) The on-channel repeater as recited in claim 1, wherein the predetermined signal of the equalizing unit includes:

a noise signal and a multi-path signal generated due to a transmission channel between the main transmitter and the on-channel repeater; and
a feedback signal generated due to low isolation of transmission/reception antennas.

4. (Original) The on-channel repeater as recited in claim 3, wherein the equalizing unit includes:

an input-to-equalizer signal storing unit for storing the signal inputted from the demodulating unit therein;

a filtering unit for performing channel equalization by repetitively filtering the signal input from the demodulating unit;

a modified viterbi decoding unit for detecting a symbol representing decision data from the output signal transmitted through the filtering unit by using a modified viterbi decoding algorithm with a Trace Back Depth TBD being one and a complexity being reduced to output the detected symbol at a decision directed mode;

a statistical data computing unit for computing and outputting necessary statistical error data at a blind mode;

a switching unit for selecting an output signal in one of the decision directed mode and the blind mode;

an error signal calculating unit for comparing the output signal representing decision data or statistical error data in the decision directed mode or the blind mode selected by the switching unit with an output signal as decision feedback equalization data of the filtering unit to calculate the error signal;

a FFF tap coefficient renewing unit for renewing a tap coefficient applied to a feedback filter unit (FFF) by using an output signal of the input-to-equalizer signal storing unit and the calculated error signal; and

a FBF tap coefficient renewing unit for renewing a tap coefficient applied to the feedback filtering unit (FBF) by using the output signal of the modified viterbi decoding unit and the calculated error signal.

5. (Original) The on-channel repeater as recited in claim 4, wherein the equalizing unit use a viterbi decoder, a modified viterbi decoder, a Soft Output Viterbi Algorithm SOVA decoder and a simple slicer as a symbol detector.

6. (Original) The on-channel repeater as recited in claim 5, wherein the equalizing unit uses a training sequence as an output signal thereof at a data duration including the training sequence, and uses an output signal of the symbol detector as an output signal of the on-channel repeater at a data duration excluding training sequence.

7. (Original) An on-channel repeating method of an on-channel repeater, the on-channel repeating method comprising the steps of:

a) receiving a Radio Frequency (RF) broadcast signal from a main transmitter to convert the received RF broadcast signal into an intermediate frequency (IF) signal based on a first reference frequency;

b) converting the downlink-converted IF signal into a baseband signal, and removing a certain predetermined signal generated between a main transmitter and the on-channel repeater, from the converted baseband signal;

c) at the time of transmission, converting the baseband signal without the predetermined signal into an IF signal, and then converting the converted IF signal into a RF broadcast signal based on the second reference frequency based on the first reference frequency so as to perform a frequency and phase synchronization with the received broadcast signal; and

d) amplifying and transmitting the uplink-converted RF broadcast signal.

8. (Original) The on-channel repeating method as recited in claim 7, wherein the predetermined signal includes:

a noise signal and a multi-path signal generated due to a transmission channel between the main transmitter and the on-channel repeater; and

a feedback signal generated due to low isolation of transmission/reception antennas.

9. (Original) The on-channel repeating method as recited in claim 7, wherein in the step b), one of a viterbi decoder, a modified viterbi decoder, a SOVA (Soft Output Viterbi Algorithm) decoder and a simple slicer is used as a symbol detector.

10. (Original) The on-channel repeating method as recited in claim 9, wherein in the step b), a training sequence is used as an output signal of the equalizing unit at a duration including the training sequence, and an output signal of the symbol detector is used as an output signal of an equalizing unit at a duration excluding the training sequence.

11. (Original) The on-channel repeating method as recited in claim 7, wherein the RF broadcast signal of the fourth step is a signal having the same frequency and phase as those of the received RF broadcast signal.

12. (New) An on-channel repeating apparatus for repeating signal over an on-channel, the on-channel repeater comprising:

a receiving means for receiving a radio frequency (RF) signal;

a demodulating means for demodulating the received RF signal into a baseband signal;

an equalizing means for equalising the baseband signal;

a modulating means for modulating the equalised baseband signal into an RF signal;

and

a transmitting means for transmitting the modulated RF signal.

13. (New) The on-channel repeater as recited in claim 12, wherein the receiving means includes:

a reception antenna for receiving the RF broadcast signal from the main transmitter;
and
a RF receiving unit for receiving the RF broadcast signal from the reception antenna.

14. (New) The on-channel repeater as recited in claim 12, wherein the demodulation means includes a carrier restoring unit for performing the frequency and phase synchronization with a pilot signal of the received RF signal, and wherein the carrier restoring unit generates a control signal, the control signal being used for modulating the equalised baseband signal into an RF signal.

15. (New) The on-channel repeater as recited in claim 14, wherein the equalizing means includes:

an input-to-equalizer signal storing unit for storing the signal input from the demodulating means;

a filtering unit for filtering repetitively the signal input from the demodulating means for channel equalization;

a symbol detecting unit for detecting a symbol from the signal input from the filtering unit;

a statistical data computing unit for computing and outputting necessary statistical error data for a blind mode;

a switching unit for selecting an output signal in the decision directed mode or in the blind mode;

an error signal calculating unit for comparing the output signal selected by the switching unit and the output signal from the filtering unit, and calculating an error signal;
and

a tap coefficient renewing unit for renewing a tap coefficient applied to the filtering unit according to the calculated error signal.

16. (New) The on-channel repeater as recited in claim 15, wherein the filtering unit includes a feedforward filtering (FFF) unit and a feedback filtering (FBF) unit, and wherein the tap coefficient renewing unit includes: a FFF tap coefficient renewing unit for

renewing a tap coefficient applied to the the feedforward filtering (FFF) unit according to the output signal of the input-to-equalizer signal storing unit and the calculated error signal; and a FBF tap coefficient renewing unit for renewing a tap coefficient applied to the feedback filtering (FBF) unit according to the output signal of the symbol detecting unit and the calculated error signal.

17. (New) The on-channel repeater as recited in claim 16, wherein the symbol detecting unit is one of a viterbi decoder, a modified viterbi decoder, a Soft Output Viterbi Algorithm (SOVA) decoder and a simple slicer.

18. (New) The on-channel repeater as recited in claim 17, wherein the equalizing means uses a training sequence as an output signal at a data duration with the training sequence, and uses an output signal of the symbol detecting unit as an output signal at a data duration without the training sequence.

19. (New) An on-channel repeating method comprising the steps of:
receiving a radio frequency (RF) signal;
demodulating the received RF signal into a baseband signal;
equalising the baseband signal;
modulating the equalised baseband signal into an RF signal; and
transmitting the modulated RF signal.

20. (New) The on-channel repeating method as recited in claim 19, wherein the demodulating step includes performing the frequency and phase synchronization with a pilot signal of the received RF signal, and generating a control signal, the control signal being used for modulating the equalised baseband signal into an RF signal.

21. (New) The on-channel repeating method as recited in claim 20, wherein the equalising step includes:
storing the result signal of the demodulating step;

filtering repetitively the result signal of the demodulating step for channel equalization;
detecting a symbol from the result signal of the filtering step;
computing and outputting necessary statistical error data for a blind mode;
selecting an output signal in the decision directed mode or in the blind mode;
comparing the result signal selected by the selecting step and the result signal by the filtering step, and calculating an error signal; and
renewing a tap coefficient applied to the filtering step according to the calculated error signal.

22. (New) The on-channel repeating method as recited in claim 21, wherein the filtering step includes a feedforward filtering (FFF) step and a feedback filtering (FBF) step, and wherein the tap coefficient renewing step includes: renewing a tap coefficient applied to the the feedforward filtering (FFF) step according to the result signal of the storing step and the calculated error signal; and renewing a tap coefficient applied to the feedback filtering (FBF) step according to the result signal by the symbol detecting step and the calculated error signal.

23. (New) The on-channel repeating method as recited in claim 22, wherein in the symbol detecting step, one of a viterbi decoder, a modified viterbi decoder, a Soft Output Viterbi Algorithm (SOVA) decoder and a simple slicer is used as a symbol detecting unit.

24. (New) The on-channel repeating method as recited in claim 23, wherein in the equalising step, a training sequence is used as an output signal at a data duration with the training sequence, and an result signal of the symbol detecting step is used as an output signal at a data duration without the training sequence.

25. (New) The on-channel repeating method as recited in claim 19, wherein the demodulating step includes:

- (a) converting the received RF signal into an intermediate frequency (IF) signal; and
- (b) demodulating the converted IF signal into the baseband signal.

26. (New) The on-channel repeating method as recited in claim 25, wherein the modulating step includes:

(a') modulating the equalised baseband signal into an intermediate frequency (IF) signal; and

(b') converting the modulated IF signal into a radio frequency (RF) signal.

27. (New) The on-channel repeating method as recited in claim 26, wherein the step (a) converts into the IF signal based on a first reference frequency from a local oscillator, and wherein the step (b') converts into the RF signal based on a second reference frequency from the local oscillator.

28. (New) The on-channel repeating method as recited in claim 26, wherein the step (b) includes performing the frequency and phase synchronization with a pilot signal of the down-converted IF signal, and generating a control signal, the control signal being used for modulating the equalised baseband signal into the IF signal.

29. (New) The on-channel repeater as recited in claim 12, wherein the demodulating means includes down-converting unit for convert the received RF signal into an intermediate frequency (IF) signal; and demodulating unit for demodulating the converted IF signal into the baseband signal.

30. (New) The on-channel repeater as recited in claim 29, wherein the modulating means includes modulating unit for modulating the equalised baseband signal into an intermediate frequency (IF) signal; and up-converting unit converting the modulated IF signal into a radio frequency (RF) signal.

31. (New) The on-channel repeater as recited in claim 30, wherein the on-channel repeater further includes a local oscillator for providing a reference frequency to the down-converting unit and the up-converting unit.

32. (New) The on-channel repeater as recited in claim 30, wherein the demodulation unit includes a carrier restoring unit for performing the frequency and phase synchronization with a pilot signal of the converted IF signal, and wherein the carrier restoring unit generates a control signal, the control signal being used for modulating the equalised baseband signal into the IF signal.